Association for Farming Systems Research-Extension

15th International Symposium

29 November - 4 December 1998
Pretoria, South Africa

PROCEEDINGS

VOLUME 2

RURAL LIVELIHOODS, EMPOWERMENT AND THE ENVIRONMENT

GOING BEYOND THE FARM BOUNDARY

E.Torquebiau[1], R.Hawkins[2], N.Sellamna[1], J.Daane[3], C. Lightfoot[1] and E. Saumon[1]

Improving training in Participatory Farming Systems Research through Internet supported learning

ICRA
Agropolis International,
Avenue Agropolis,
34394 Montpellier CX5,
France
Telephone (33) (0)467 047 527
Fax (33) (0)467 047 526
e-mail : icra@agropolis.fr

[2] ICRA,
Colegio de Postgraduados,
Sede Puebla - Apdo Postal I -12 C.P. 72130 Puebla, Pue., Mexico

[3] ICRA,
P.O. Box 88 - 6700 AB
Wageningen
The Netherlands[1]International Centre for development oriented Research

Abstract

The training programme of the International Centre for development oriented Research in Agriculture (ICRA) covers team interdisciplinary approaches to farming systems, stakeholders' participation and screening research options against criteria of competitiveness, equitability, sustainability. The 6 month programme is determined by the need to allow participants to acquire sufficient knowledge and apply this to a 3-month research assignment. Evaluations have revealed improved skills in participants and useful analyses made by field teams. Insufficient impact and diverse performance in applying the acquired knowledge were however identified. Training costs have also limited ICRA's quantitative impact. To upscale ICRA's programme, we have developed training modules available through the Internet. Beyond increased impact, the objective is to make training more interactive. We have used the Internet site during our in-house programmes in 1998 and intend to use it in decentralized training activities from 1999, with a reduced number of resource persons. The main issues arising through Internet assisted learning is the constructive attitude of trained people to knowledge acquisition, and the degree to which more remote groups can be organised and facilitated through Internet.

Introduction

Training in participatory methods for farming systems research poses pedagogic challenges of a specific nature. Both participation and the systems approach are concepts which require careful handling of training activities in order to make sure that a pragmatic yet meaningful and comprehensive message is conveyed. ICRA has been addressing these issues for the last 17 years by running a professional training programme on development oriented agricultural research designed for small groups of about 20 research scientists. After a 3-month knowledge acquisition phase, this programme culminates in a 3-month field study

Formation of ridges along the contours was found to increase the crop yields substantially over the control (flat beds). The average increase in crop yields with ridge plots over flat bed (control) plots was 10.28 per cent (sorghum) and 10.51 per cent (lady's finger), and 22.68 per cent (castor var. 48-1) and 33.3 per cent (castor var. Aruna). The increase in yield was mainly due to increased water storage and grater volume of soil available for root growth.

Economic analysis of ridge technology (Table 10) indicatd the benefit cost ratio of Rs. 17.12 for castor

Table 10 : Economics of Ridge Technology for Castor

Cost of ridge formation	Rs. 80.00
Custom hiring charges for ridge plough	Rs. 20.00
Extra investment required per hectare	Rs. 100.00
Average increase in yield due to ridge technology over flat beds.	= 3.02 q ha^{-1}
Cost of Castor seed per quintal	= Rs. 600.00
Extra returns	= 3.02 x 600
	= Rs. 1812.00
Net returns	= Rs. 1712.00
Benefit:cost ratio	17.12

Therefore, it may be concluded that by adopting simple soil management technologies like paddy husk incorporation, clay mixing, contour cultivation and formation of ridges, sustainable crop production could be achieved and income of the farmers could be increased under rainfed conditions in Alfisols of Peninsular India. For better transfer of technology simple experiments may be conducted in the farmers fields involving the farmers in the conducting of the trials.

REFERENCES

1. El-swaify, S.A, walker, T.S. and Virmani, S.M. (1983). "Dryland management alternatives and research needs for Alfisols in the semi-arid tropics," Paper presented at the workshop held at ICRISAT Center, India 1-3 December 1983.

2. SPCIP (1985-86). Annual report of Soil Physical Conditions Improvment Project, Hyderabad centre.

Table 7. Effect of contour cultivation on yield (q ha^{-1}) of crops

Treatment	Castor	Sorghum	Lady's finger	Tomato	Cluster beans	
Sowing along the slope	9.69	16.11	31.4	49.3	28.2	
Sowing on contour		16.96	20.81	42.5	69.1	39.1
t-test		*	*	*	*	*

d) Ridge technology:

The effect of formation of 10 cm high ridges on yield of sorghum, lady's finger and castor was demonsrated. The ridge formation increased the soil moisture content throughout the growth period of the crops (Table 8).

The average increase in soil moisture content due to formation of ridges was around 14 per cent in sorghum, 10 to 14 per cent in lady's finger and 7 to 17 per cent in castor over flat beds (control).

Table 8: Effect of ridges on soil moisture (g 100 g^{-1}) in surface soil during crop growth.

Stage of crop	Flat beds	Ridges	% increase over flat beds	t-test
		Sorghum		
30 DAS *	12.3	14.1	14.6	*
60 DAS	13.0	14.7	13.1	*
		Bhendi		
60 DAS	9.9	10.9	10.1	*
Harvest	6.9	7.9	14.5	*
		Castor		
90 DAS	5.23	5.61	7.2	*
104 DAS	6.27	7.38	17.7	*

* DAS - days after sowing

The beneficial effect of ridge formation was reflected in plant parameters such as plant height, earhead length and yield of crops (Table 9).

Table 9: Effect of formation of ridges on the yield of crops (q ha^{-1})

Crop/Variety	Flat beds	Ridges	% increase	t-test
Sorghum (SPV-386)	20.34	22.43	10.28	*
Bhendi (Pusa sawani)	106.60	117.80	10.51	*
Castor (48-1)	13.77	16.88	22.58	*
Castor (Aruna)	12.00	16.00	33.33	*

Table 5 : Economics of clay mixing

Percentage of clay added in the form of black soil to increase the clay content of excessively permeable soil	:	2 %
Quantity of black soil required	:	100 t ha^{-1}
Loading, unloading and transport cost of black soil	:	Rs. 1,500.00
(Black soil is available in local tanks free of cost)		
Cost of spreading black soil	:	Rs. 150.00
Total cost	:	Rs. 1,650.00
Extra yield of bhendi obtained due to clay mixing	:	11.28 q ha^{-1}
Cost of 1 q of bhendi	:	Rs. 200.00
Extra income per hactare (11.28 x 200)	:	Rs. 2,256.00
Net benefit	:	Rs. 606 ha^{-1}
Benefit: cost ratio	:	1.37

c) Contour cultivation and sowing:

Experiments were conducted to demonstrate the effect of contour cultivation on *in situ* moisture conservation and yield of crops.

Contour cultivation increased the *in situ* moisture conservation considerably (Table 6) over control i.e., sowing along the slope, by reducing the speed of runoff and giving more opportunity for rainwater to infiltrate into the soil. As the soil moisture is the controlling factor for the yield, the increased moisture content resulted in higher yields of castor, sorghum and vegetables such as lady's finger, tomato and clusterbean (Table 7).

Table 6: Effect of contour cultivation on soil moisture content (cm per 15 cm depth) in surface soil during growth of sorghum

Treatment	At 60 DAS	At Harvest	t-test
Sowing along the slope	0.40	0.19	*
Sowing on contours	0.79	0.32	*

DAS : days after sowing

implemented by teams of 5 participants. These teams work in partnership with local research institutions according to terms of reference specifying a development oriented research topic relevant to the institution. They produce a report presenting the team's recommendations to the questions asked in the terms of reference. Both the knowledge acquisition and field study phases have specific requirements.

During the knowledge acquisition phase, a wide range of concepts, methods and procedures have to be covered. The main topics are : (i) team interdisciplinary approaches to farming systems, (ii) stakeholders' participation in the research and development process, (iii) screening research options against criteria of economic competitiveness, social equity and ecological sustainability and (iv) formulating operational research recommendations. Because no two commisioned studies are alike and due to the many context-sensitive decisions surrounding systems research, it is not possible to propose these topics as a 'recipe' to be applied. Rather, it is important to present them as a 'basket of options' from which to choose. Thus, the pedagogy of the knowledge acquisition phase does not rely on traditional lectures but on sessions combining exercises, group discussions, individual work and a relatively small amount of listening to lecturers (Hawkins, 1997).

Major issues during the field study phase are group management (decision making, sharing of tasks among members of interdisciplinary teams), the degree to which the outputs of any given step determine activities for the next step, and the permanent need for adjusting activities acccording to new findings, or even revisiting past results, through an iterative process. Another challenge is to make sure that stakeholders' participation is effective at all stages of the research process. Finally, working under a systems approach, both in terms of bio-physical and socio-economic systems, implies that scientists be permanently open to multiple source of informations and varied analytical procedures.

Programme evaluation through participant survey revealed increased 'confidence' on the part of participants in carrying out their jobs (Hawkins, 1997). A mail survey of scientists from partner institutes involved with ICRA field studies revealed that analyses resulting from field studies were useful and that subsequent action had been taken on about half the recommendations. Eventual impact on research or extension however, was judged insufficient by 50 to 75% of the respondants (Torquebiau and Knoche, 1995). Institutional constraints were ranked high in explaining why the studies failed to have the expected impact, while contrasted performance was observed in the way the acquired knowledge was applied during the field study and beyond. One explanation is that ICRA, given the costs associated with a 6-month training programme, can train only a small number of people from a given institution. Thus, there is seldom a critical mass of scientists at any given place who are equipped with the procedures for development oriented agricultural research. In order to address the above constraints and scale up its training programme, ICRA decided in 1997 to launch a series of training modules on the Internet.

The ICRA Internet site

The original ICRA module initiative had as objectives : (i) to respond to the demand for in-country or regional training, (ii) to provide ICRA participants with adequate training materials for further reference and as a basis for the training of other people, (iii) to provide training products that can be used by a broader public and (iv) to synthesize available knowledge on development oriented interdisciplinary agricultural research. During planning of the initiative in 1997, it quickly became clear that the Internet would allow ICRA to adequately reach the above users yet offer flexibility in use and eventual distribution of the training products in a variety of additional formats (on-line, CD-ROM, diskette, paper).

The ICRA Internet site (http://www.icra.agropolis.fr/) was established in January, 1997. It was initially an information site, describing ICRA, its mandate, members, publications, and providing information and registration facilities for interested participants. In January 1998, a training programme link was added, with materials to support the on-going anglophone and francophone programmes. A sister site has been established for the hispanophone programme, in collaboration with the Red de Metodologías de Investigación de Sistemas de Producción (RIMISP) and the Colegio de Postgraduados in Puebla, Mexico

(http://www.rimisp.cl/mexprogr.htm). The idea was to develop the site as the in-house regular programme was going-on, in order to have a first operational site in 1998, which could then be updated and used in decentralized training activities as from 1999.

To achieve this, resource persons for the training programme (both ICRA and non-ICRA staff) were instructed beforehand to prepare their training session and the training materials accompanying it as a function of an eventual use through the Internet site, even though on-line training was not fully operational in 1998. The specific objectives declared for the Internet-assisted training were (i) deliver a structured message for implementing a procedure of development oriented research in agriculture, (ii) stimulate a discovery learning attitude through an interactive pedagogic approach and (iii) allow ICRA to further disseminate its training programme through decentralized activities without the physical presence of resource persons. Although sessions appeared to be strongly influenced by the personality of the different resource persons, the common denominator for all was (i) on-line instructions in the form of a learning framework describing activities for the session, (ii) training materials for group exercices, case-studies, etc., (iii) summary document of the main points discussed and (iv) further reading and proposed links to other sites.

It is important at this stage to highlight the fact that ICRA does not intend to develop an on-line training facility for use by individually registered users. Rather, it intends to have a site for decentralized training activities with groups of users 'coached' by a training coordinator in the context of a partnership with ICRA. This is first because ICRA is not a degree-granting institution and as such does not require a formal registration and evaluation procedure and second, because ICRA insists on a group approach to training and to implementing development oriented agricultural research. Under this approach, the ICRA-appointed training coordinator will 'accompany' the group in using the training resources of the Internet site and the preparation of a field study. However, ICRA also wanted to design its Internet site for possible use by a wider public. Thus, the site has been divided into 2 main parts (Figure 1).

As Figure 1 shows, the resource book, which is the central part of the site, where synthesized information on the topics discussed during the programme can be found, can be accessed via 2 ways. One is for all users, via a click on the topic map; the other one is via the programme schedule and the learning tasks, for registered users who are given a password. Thus, the restricted part of the site is function of particular training events and will be regularly updated, while the resource book can be browsed by any interested user and might be updated independently. The division of the site into 2 parts also allows ICRA to keep in the restricted access part all practical details as well as information which might not be ready or appropriate for open access.

The topic map is another important component of the site. As shown on Figure 2, it synthesizes visually the different parts of the programme and, by taking participants through a logical sequence of steps, answers one of the major objectives of the ICRA training module initiative, i.e. 'deliver a structured message for implementing a procedure of development oriented research in agriculture'. A series of steps appearing in the topic map are used to structure the programme schedule, hence leading participants through the general procedure and associated knowledge components which teams will eventually implement in the field. One lesson we have learned though, is that it is difficult to present the concepts and methods components within the framework of a defined procedure, as various elements (e.g. 'stakeholders') are relevant at several steps of the procedure. The issue here is that the learning process is rather linear while the research process is not, hence making it impossible to have the the two processes coinciding.

This compromise between a well structured modular approach and a 'basket' of concepts and methods goes some way towards answering a regular request by participants for some form of 'recipe' for development oriented agricultural research - without giving up our conviction that such a recipe does not exist. Ideally, since we argue that a non-linear, systems approach is an appropriate way to analyse farming and the rural world, we should use a similar approach in associated training activities (see e.g. Bordage, 1994 ; Jouve, 1994 ; Karlheinz, 1994). As Jiggins (1994) states, positivist traditions have to be challenged by other systems of inquiry such as constructivist perspectives and decision-making in conditions of

uncertainty involving many actors. Such new attitudes imply skills from research personal which are not obtained from conventional higher education programmes. Thus, a compromise has to be found between some linear process of transfer of information and an open-ended, interactive learning process, allowing trained people to put in practice an 'interactive agricultural science' (Rölling, 1996). Such was the challenge of the ICRA Internet modules initiative.

Evaluation and future use of the ICRA Internet site

As often stated by education specialists, computer training cannot be a substitute for face-to-face communication (e.g. Cox and Chapman, 1996), and the need for the physical presence of the trainer will always remain. Similarly, the computer's screen will never replace paper which you can annotate and take away in your bag. These are perhaps the two first lessons learned from the implementation of the Internet-based ICRA programme. Participants systematically printed training materials, even though these were available on-line, and highly valued interventions by resource persons, be these guidance for exercises, moderated discussions or more conventional, lecture-type inputs. This was perhaps caused by the fact that we had only one computer for 2 persons, although we believe that it expresses a more fundamental need for concrete -as opposed to virtual- training.

Computers were very much appreciated in terms of group or individual activities, possibility for compilation of training information in an electronic format for further use (diskette), communication with resource persons (on-line evaluation and e-mail facilities) and of course, free access to the Internet. A clear change was observed in participants' behaviour, who tended to remain after training hours to use the computers, 'surf' on the Internet and interact in small groups, as opposed to immediate departure after training sessions in the past.

Navigation on the ICRA site itself was initially found to be difficult because of the division of the site in 2 parts (Figure 1). To address this problem, ICRA envisages to simplify and reduce the number of links in the site (while still conserving the division in free and restricted parts). Similarly, the spreading of information into the 3 categories of modules (Figure 2) was evaluated as cumbersome, especially the regrouping of concepts and methods in specific modules while only the 4 procedure modules (subdivided into 12 steps), were used to structure and run the training programme. Also, the sequencing of the procedure as a linear series of steps was found to be reductionist and actually in contradiction with our objective of applying systems thinking to farming systems training. In future programmes, we intend to present the procedure for development oriented research in agriculture as a non-linear series of steps (Figure 3) and organize information on concepts and 'tools' as a function of these steps. We also plan to support each session by adding in the resource book a series of on-line visual documents summarizing the main issues under every topic and guiding the user to other resources.

Although resource persons were instructed to prepare their inputs as a function of the Internet site, these were not really innovative in terms of interactivity and computer assisted learning. They rather were a mere electronic version of training materials otherwise used on paper, thus probably explaining why printing was always favoured. It appears that the development of training materials for direct use on the computer, and hence via the Internet, is a radical change for which most resource persons are not yet ready and which consequently requires more input from specialists in communication and computer assisted learning, in order to design truly interactive training products. Only through such an approach can a constructive attitude to information seeking be fostered. This is crucial if we are serious about our intention of developing a non-linear, systemic training approach, matching with the principles of participatory farming systems research.

We believe nevertheless that the present version of the ICRA Internet site will allow us to decentralize our training activities with the assistance of a minimum number of external resource persons, e.g. one training coordinator familiar with all major subjects covered in the programme and supported by the Internet based material, as opposed to a dozen of resource persons presently. In such activities, groups of participants will

have free access to the site, including the restricted part containing the detailed learning framework and programme of the particular training event, and will start all sessions with on-line instructions. Participants will then engage in group or individual activities, ranging from reading, to case-studies, practicals, oral or written presentations, audio-visual activities, etc., and eventually contribute to a debate and wrap-up session moderated by the training coordinator. This represents a pragmatic trade-off between conventional lecturing and fully interactive training, able to promote a reasonably constructive attitude to knowledge acquisition. Since the different modules -although belonging to a same procedure- are developed independently, it should also be possible to run the programme in a flexible manner, adjusting the relative importance of the different parts of the programme. This, however, remains to be confirmed after running some decentralized training programmes.

Since e-mail and on-line evaluation facilities were appreciated by 1998 participants, we are confident that these can be used in the facilitation of remote groups via the Internet. After initial activities of remote groups according to on-line instructions, resource persons having prepared the training materials could be required to book time at their office to answer e-mail questions or contribute to newsgroups or on-line chat sessions. Similarly, session evaluations could be e-mailed to resource persons and analysed in real time at both ends.

A final but crucial evaluation criterion is the way Internet supported learning can impact actual work on participatory farming systems research. Since the groups who have undertaken this training are still in the field at the time of writing these lines, it is too early to make a judgement on this. However, a tendency for a greater autonomy of the groups has already been observed. Evaluation of the final reports will reveal whether this attitude has translated into higher quality farming systems research.

References

Bordage, B. 1994. Pour une approche systémique de l'ingéniérie de formation. p. 823-826 *in* : *Systems Oriented Research in Agriculture and Rural Development*. Proceedings International Symposium, November 1994. CIRAD, Montpellier, France.

Cox, P.G. and Chapman, S.C. 1996. Caught in the web : use of the Internet in agricultural research , development and extension. p. 164-167 *in Proceedings 8th Australian Agronomy Conference, Toowoomba, Queensland,* 30 Jan – 2 Feb 1996. The University of Southern Queensland.

Hawkins, R. 1997. Training in interdisciplinary team research for agricultural development : the experience of ICRA. *European Journal of Agricultural Education and Extension* 4, 1 : 49-66.

Jiggins, J. 1994. Systems approaches : The challenge to University teaching. p. 791-795 *in* : *Systems Oriented Research in Agriculture and Rural Development*. Proceedings International Symposium, November 1994. CIRAD, Montpellier, France.

Jouve, Ph. 1994. Approche systémique et formation des agronomes. p. 834-840 *in* : *Systems Oriented Research in Agriculture and Rural Development*. Proceedings International Symposium, November 1994. CIRAD, Montpellier, France.

Karlheinz, K. 1994. Application of systems thinking to improvement of higher education in agricultural science. p. 796-802 *in* : *Systems Oriented Research in Agriculture and Rural Development*. Proceedings International Symposium, November 1994. CIRAD, Montpellier, France.

Rölling, N. 1996. Towards an interactive agricultural science. *European Journal of Agricultural Education and Extension* 2 : 35-48.

Torquebiau, E. and Knoche, U. 1995. ICRA field study impact assessment : a summary of findings. International Centre for Development oriented Research in Agriculture, Wageningen, The Netherlands, 6 p.

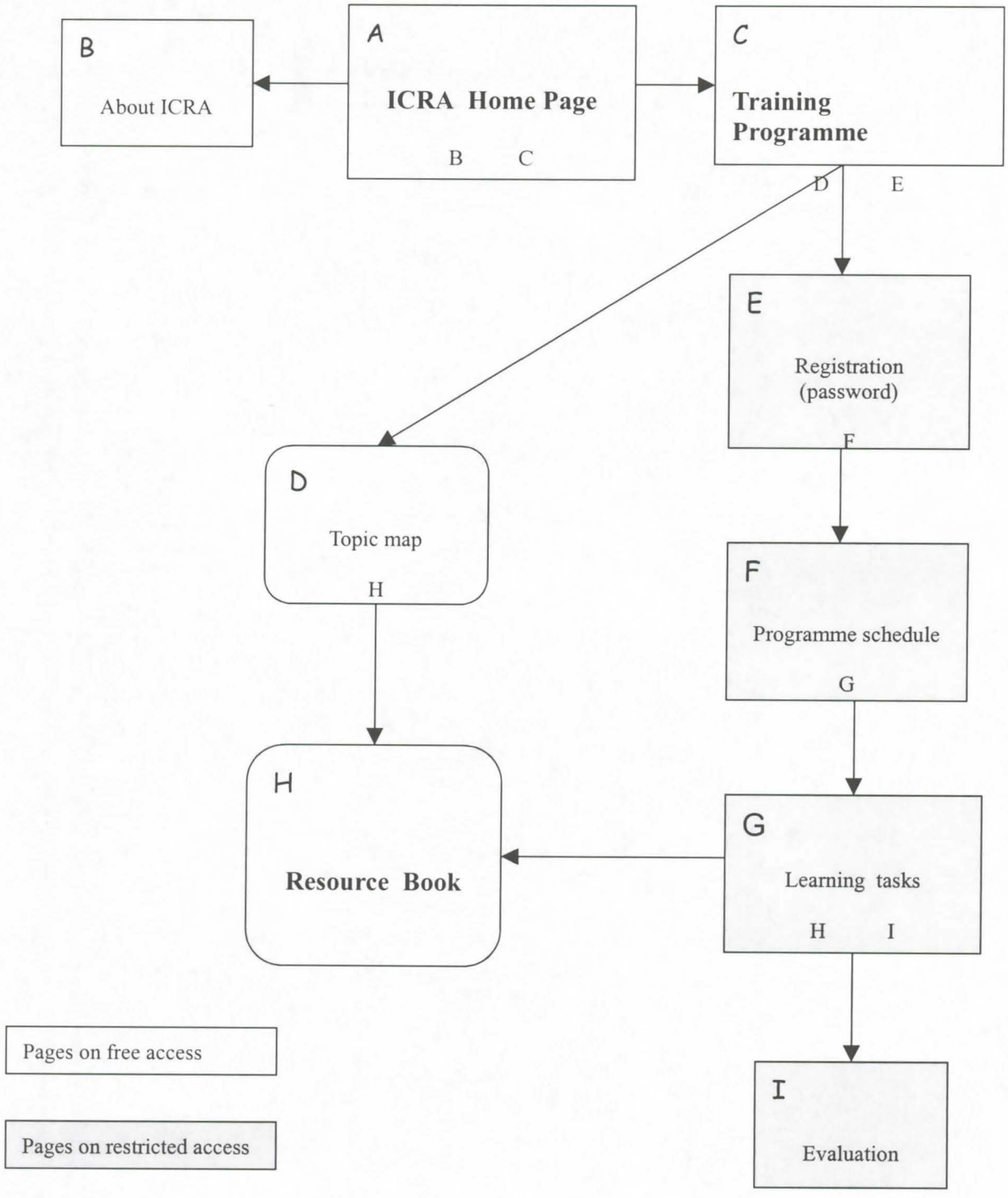

Figure 1 – Structure of the ICRA Internet site

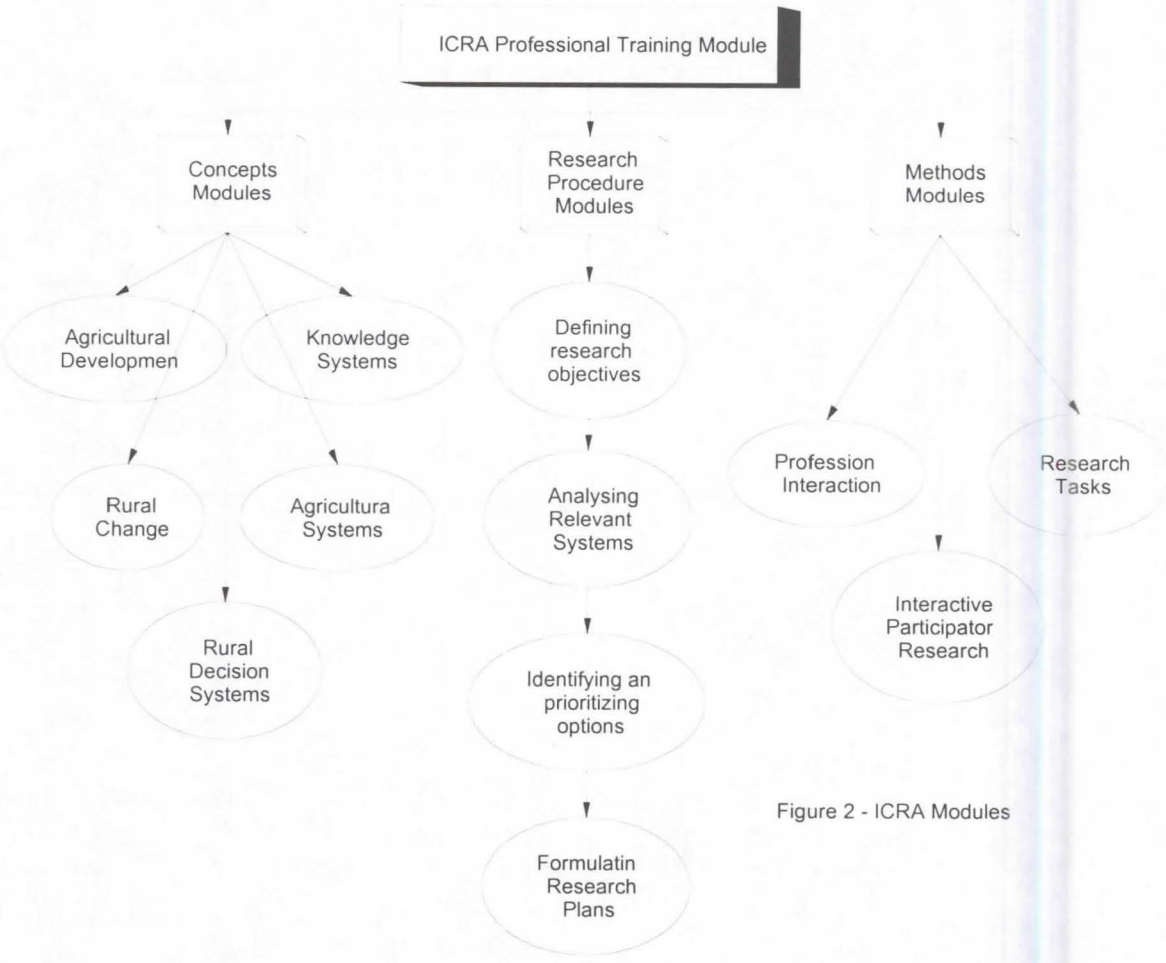

Figure 2 - ICRA Modules

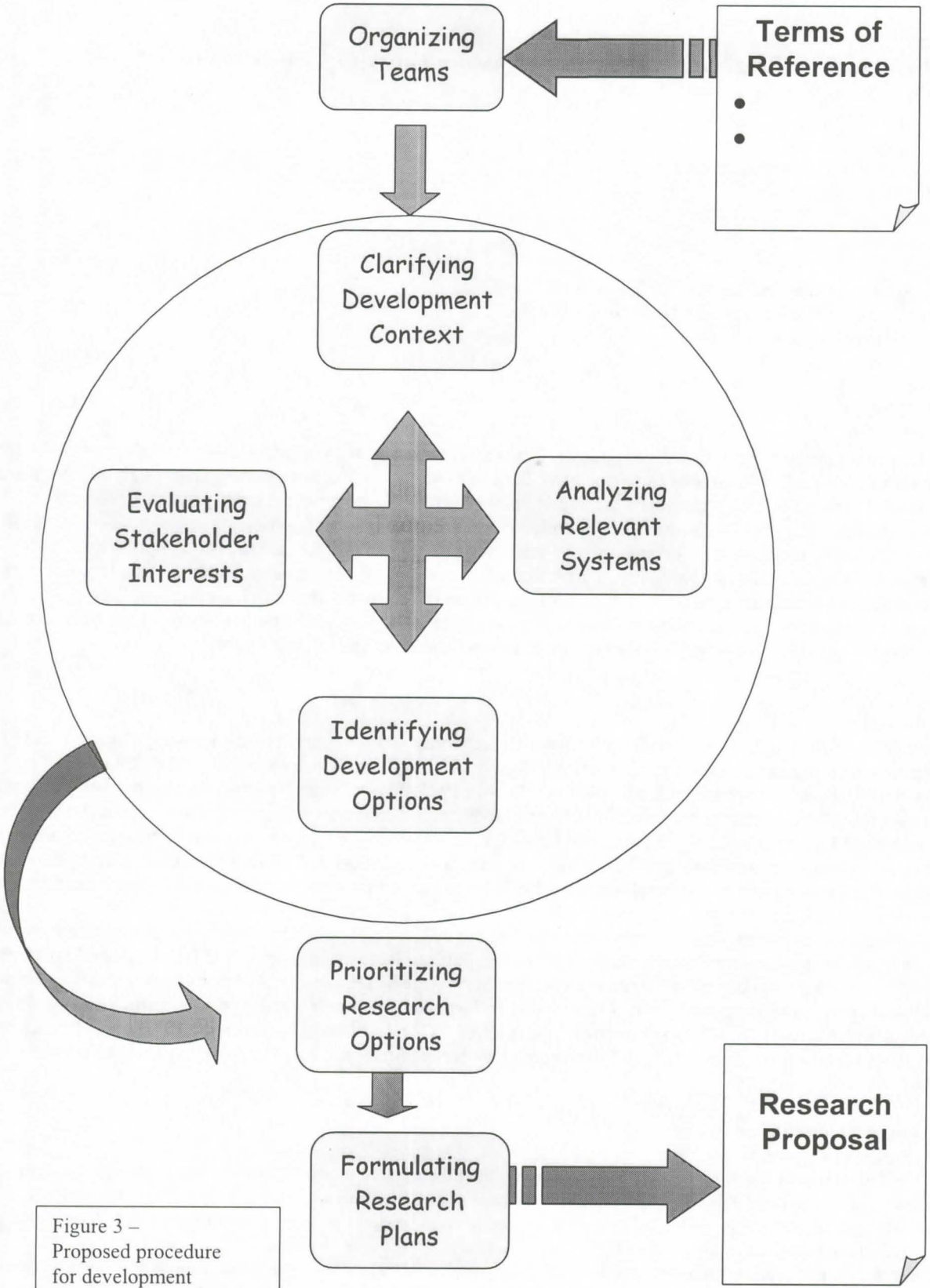

Figure 3 – Proposed procedure for development oriented agricultural research